
APPENDIX A
PROCEDURE FOR PERFORMING ROTATIONAL CAPACITY TEST
LONG BOLTS IN TENSION CALIBRATOR

ROTATIONAL CAPACITY (RC)

Rotational Capacity (RC) Test for all high strength fasteners shall be performed in the field as required by Article 4153.06 of the Standard Specification.

There are two separate rotation capacity requirements:

1. Fasteners (bolts, nuts and washers) received at the project site shall have been RC tested by the supplier or manufacturer prior to shipment. Each combination of production lots must have a special RC lot number. This number must be readily identifiable on each container of fasteners.
2. Prior to installation, the contractor shall be required to field test all RC lots as supplied.
NOTE: Field tests are not intended to match the values provided by the suppliers.

EQUIPMENT REQUIRED

1. Calibrated bolt tension measuring device of size required for bolts to be tested
2. Calibrated torque wrench
3. Shims shall have a minimum cross sectional area of 5 times the cross-sectional area of the bolt being tested. The hole in the shim adjacent to the washers shall not be larger than 1/16" (2mm) than the bolt diameter being tested.
4. Steel section to mount tension measuring device (Flange of girder or cross frame accessible from the ground is satisfactory.)

PROCEDURE

1. Install the bolt into the tension calibrator. Install the required number of shim plates and/or washers. One washer under the nut must always be used to cover a minimum of three full threads. A combined total of no more than five shims and washers may be used. (Need a minimum of 2-3 threads behind nut, when properly installed.)
2. Tighten the nut using a hand wrench to the initial tensions listed on the following page.
Tolerance: 0 kips, + 2 kips (-0 kN, + 9 kN)

Table A-1

Bolt Diameter (in.)	1/2	5/8	3/4	7/8	1	1 1/8-	1 1/4	1 3/8-	1 1/2
Initial Tension (kips)	1	2	3	4	5	6	7	9	10

Table A-1M

Bolt Diameter (mm)	13	16	19	22	25	29	32	35	38
Initial Tension (kN)	4	9	13	18	22	27	31	40	44

- Match mark the bolt tip, nut, and the face plate of the bolt calibrator in a straight line.
- Using the calibrated manual torque wrench, tighten the nut to at least the bolt tension listed below. Record the values of the torque and tension. Torque must be measured with the nut in motion.

Table A-2

Bolt Diameter (in.)	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
Tension (kips)	12	19	28	39	51	56	71	85	103

Table A-2M

Bolt Diameter (mm)	13	16	19	22	25	29	32	35	38
Tension (kN)	53	85	125	173	227	249	318	378	458

- Calculate and record the value: $0.25 \times \text{Bolt diameter (inches)} / 12 \times \text{Tension (kips)} \times 1000$. The torque measured and recorded in Step 4 must be equal to or less than this calculated value. Assemblies with torque values exceeding this calculated value fail the test.
- Further tighten the nut to the rotation listed below. The rotation is measured from the initial marking in Step 3. Record the bolt tension. Assemblies fail the test if stripping or fracture occurs.

Table A-3

Bolt Length (measured in Step 1)	4 x bolt diameter or less	Greater than 4, but no more than 8 x bolt diameter	Greater than 8 x bolt diameter
Required Rotation	2/3	1	1 1/3

7. The bolt tension measured in Step 6 after the required rotation must equal or exceed the values in the table listed below. Assemblies, which do not meet this tension, have failed the test.

Table A-4

Bolt Diameter (in.)	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
Tension (kips)	14	22	32	45	59	64	82	98	118

Table A-4M

Bolt Diameter (mm)	13	16	19	22	25	29	32	35	38
Tension (kN)	62	98	142	200	262	285	365	436	525

8. Loosen and remove the nut, and examine the threads on the nut and bolt. No signs of thread shear failure, stripping, or torsional failure of the bolt should be evident. Assemblies, which have evidence of stripping, fail the test.